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No Room for Diversification: The Myth of Portfolio Gains in the Integrated European Stock Markets

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Abstract
This study explores the integration in the stock markets of Germany, Europe, Switzerland, the United Kingdom, Spain and the Netherlands. Daily data is collected, and for studying the long-term relationship, Co-integration is used, which shows that European stock markets are cointegrated. For checking the short-run relationship, Vector Error Correction Model is applied which reveals that significant imbalances has been taken place but it's the IBEX only which moves in the opposite direction to correct these changes while the short run error correction shows that adjustment process is more prominent in the stock markets of DAX, SWISS, LSE, IBEX as compared to the EURONEXT and FTSE. Granger Causality results show that LSE is leading the majority of the European Capital market. Furthermore, the Impulse response test shows that the stock markets of all the countries respond significantly to their own markets, except the EURONEXT and SWISS, which respond to the DAX instead of their own. Variance decomposition test shows that the majority of the correction in the stock markets of DAX, LSE, IBEX and FTSE is done by their own while in the case of SWISS & EURONEXT, such correction is done by the LSE. In the long run, the potential gain from international portfolio diversification in the European stock markets won't work at all on account of the strong integration of these capital markets, and investors have to move towards the emerging economies to get the portfolio gains.

Keywords: Portfolio Diversification, Vector Error Correction Model, Stock Market Integration, Co-integration: European Stock Markets

Introduction

Across-border investment has increased manyfold in recent years due to more liberalised capital flows (Wei, 2025), and on the other hand a better communication among institutional as well as individual investors across the border facilitates a better integrated global financial market (Jamal, Lamba & Rai, 2025). To guarantee more financial stability and sufficient funding for the EU to compete in a global economy, European policies are now aimed at the more integrated capital markets (Novak et al., 2022; Pennesi, 2021).

Furthermore, in the wake of globalisation, fund managers are more concerned with the securities with minimum correlation by holding a more diversified portfolio of securities, to avoid risk (Armour, Bengtzen & Enriques, 2017). This diversified investment across the borders would lead to a more efficient and integrated financial market, leading towards a financial system in which individual stock markets would be unable to exhibit independent behaviour (Anderson, Guirguis & Harris, 2020). The failure of this independent behaviour urged us to study the integration of the financial markets, a much-debated subject in the recent past (Canova, 2009). Inefficient integration of European markets hindered the cross-border financial transactions to set off the aftermath of the global financial crisis (Ukhnal et al., 2025).

As per CAPM (Capital Assets Pricing Model), Efficient Market Hypothesis and Arbitrage Pricing Theory, the information is used and fused while pricing the securities, but that doesn't happen in the real world (Razzaq et al., 2016). As we depart from the standard models of finance, we find that sometimes the markets are co-integrated and there also exists a lead-lag relationship between them, which doesn't permit these markets to perform in the way that is prophesied by the philosophies of Finance. Furthermore, the theory proposes that the free flow of capital should result in the strong integration of the markets (Mussa & Goldstein, 1993). The implication for the international and institutional investors is that in the long run, the potential gain from the international portfolio diversification in such integrated markets won't work (Chiou et al., 2009).

European financial markets have faced certain challenges over the last two years, and it is become more volatile (Hillier, Grinblatt & Titman, 2023). The European markets are affected by several factors like renewed tensions around Greek Developments and the purchase program of expanded assets (Xiuzhen, Zheng & Umair, 2022). Moreover, there emerged certain international factors which affected these markets like the market turmoil in China and other emerging markets, sudden decline in the commodity prices, diverging monetary policies and declining trends in the economic growth of the whole European markets (Baffes & Nagle, 2022; Shafique, 2025). Apart from these domestic and international factors, a change was observed in the behaviour of the investors as well. They have started an abrupt reassessment of the risk, and that leads to the sudden decline in the prices of all the risky assets. The whole financial sector performed poorly, and investors started worrying about their profits in the banking sector, the flattening of yield curves and sustained negative interest rates (Bhansali, 2021; Kang, 2024). This study is an effort to check the integration between the different European stock markets so that we can get an insight into their relationship and be able to amend and diversify our investment policies accordingly.

Several studies has been undertaken to study only the long-run relationship between different stock markets by employing different methodolgies while the objective of this study is to investigate the price discovery role of the European stock markets and to explore the long run and short-run relationship between these stock markets

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and their related speed of adjustment (Agostinetto, 2018; Haque, 2024). Furthermore, the study aims to discover the lead-lag relationship between European capital markets.

The choice of this study for the European countries is motivated in part by the rapid development of these countries over the last two decades, and it offers an excellent opportunity to analyse the dynamics of economic growth (Armeanu, Vintilă & Gherghina, 2017). With the expansion of the European capital market, the EU has become a focal point of all the studies as it is considered an ideal place for investment (Mügge, 2024). Therefore, the effort of this study is to find how investors can diversify their risk by investing in different combinations of stock markets in Europe. The existing studies have used a shorter time period; however, this study uses the latest data from 2000 to 2025, which would reflect the global trend towards the more sound integration of the European capital markets. This study aims to provide insight into how the European stock markets responded to the changes that occurred in the last decade. So effort of this study is just to fill that gap.

The study is organised as follows: The first chapter introduces the topic, and Section 2 discusses the literature and Section 3 discusses the methodology used in this study. Section 4 provides the results of the statistical methods and models, while Section 5 concludes the study by giving investor implications.

Literature Review

Many studies have used the cointegration technique to find relationships among stock markets. Voluminous literature demonstrated a long-run relationship between different stock markets, and the majority of these studies have employed impulse response functions and causality tests to examine these relationships. Some evidence of this literature can be found in Aggarwal and Rivoli (1989), Cheung and Mak (1992), Arshanapali and Doukas (1993), Gerrits and Yuce (1999). Fraser and Oyefeso (2005) examined the relationship among stock markets of the UK, US, France, Germany, Spain, Belgium, Sweden and Denmark. By applying a multivariate cointegration test, this study found a single common stochastic trend, due to which all markets have a long-term relationship. Heilmann (2010) has studied stock market linkages between the US and Asian Stock markets. As a result of Johansen's cointegration test, the author found that US markets strongly influence Asian Stock markets in both the Long and Short run and more, this dissertation revealed that the cointegration relationship of these stock markets, especially the US and Japan, significantly changed Asian Financial Crisis of 1997/1998.

Khan (2011) investigated the association among stock markets of Korea, Malaysia, France, Spain, Austria, the US and the Netherlands. This study applied Gregory and Hansen's and Johansen’s tests on daily values as well as on the latest data of these stock markets. Johansen Test could not find any relationship in many cases (only the Netherlands and the US market have found cointegration). While Gregory and Hansen test results showed cointegration in all cases. Assidenou (2011) used a cointegration approach to study the relationship among major capital markets during the financial crisis of 2008 (originating from the US markets). By using daily closing data of international stock markets, these indices have one cointegrating vector. This

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study concluded that during the financial crisis (2008), Asian capital markets remained cointegrated and investors could not keep them safe, although these markets are not directly related to international markets.

Syllignakis & Kouretas (2010) studied the long-term relationship between two developed stock markets (US and German) and seven Central and Eastern European (CEE) emerging stock markets. Recursive cointegration analysis revealed the stability of the long-term relationship in these markets. It was also found that the EU accession process has increased linkages between the world and CEE markets. Gilmore and McManus (2003) studied the long-term relationship between Germany and the three most credible candidates for membership in the European Union and found no long-term relationship between the German Market and Central European markets. The relationship between the US and the four Latin American Markets (Argentina, Brazil, Chile and Mexico) was studied by Diamandis, P. F. in 2009. Results of the autoregressive and VAR models suggested that these stock markets are partially integrated.

Tabak et. al (2010) investigated the cointegration relationships and causality between the stock markets of the United States and Latin America. Stock markets of Argentina, Mexico, Brazil, Chile, Peru, Venezuela, Colombia and the US were used to imply cointegration. No evidence of cointegration was found among these markets in the long run. But short-run causality could not be proscribed. Additionally, the impulse response test was used to analyse the effect of financial shocks in the US market. Results suggested that these responses were different in different markets, showing diversification. Bonfiglioli and Favero (2005) endeavour to study interdependence in the German and the U.S. stock markets. Unfortunately, results showed no interdependencies between these markets, while massive fluctuations in US markets influence German markets. Masood et al. (2010) investigated the relationship between Baltic countries (Estonia, Latvia and Lithuania) and found that the stock markets of these countries are co-integrated.

METHODS AND STATISTICAL METHODS

This study used Co-integration for studying the long-run relationship in the capital markets of Europe, while for studying their short-run relationship Vector Error Correction model is used. Once the study determines the order of cointegration of price series, it moves to the next steps for checking the long-run relationship among the price series. For checking co-integration, if the series are co-integrated of the order, i.e. I(1,0), then the Johansen-Juselius approach could be used, which would determine the number of cointegrating vectors by checking the maximum-likelihood estimation values. At the first step, the prices of all the stock markets are altered for their returns by capturing the first difference of the log of two sequential days.

$$\boldsymbol{R_t} = \mathbf{Ln}\ (\boldsymbol{P_t}/\ \boldsymbol{P_{t-1}}) \qquad \mathbf{(1)}$$

Where $\boldsymbol{R_t}$ = Return on day t

$\boldsymbol{P_{t-1}}$ Price of the stock on day $\boldsymbol{t-1}$

$\boldsymbol{R_t}$ Price of the stock on day t

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Test for Stationarity

The first requirement for testing the Co-integration is to check the order of their integration. If a series is $Y_t \sim$ I (d), then it means that the series Y_t becomes stationary subsequently differenced d times. After knowing about the order of integration, it is decided whether to go for the J & J approach or for the ARDL. The study uses the Augmented Dicky Fuller test, while many tests are accessible in the writings. This study uses this test, for Perron and Cambell (1991) discovered that it gives healthier results for small sample properties.

$$\Delta Y_t = \alpha^{\circ} + \alpha_1 Y_{t-1} + \sum_{i=1}^{L} \delta i \ \Delta Y_{t-i} + \epsilon_t \quad (2)$$

$$\Delta Y_t = \alpha^{\circ} + \alpha_1 Y_{t-1} + \alpha_2 T + \sum_{i=1}^{L} \delta i \ \Delta Y_{t-i} + u_t \quad (3)$$

Where α_1 *and* α_2 are the constants, α° is the intercept, u_t and ϵ_t are the disturbance terms, **T** is the time period**, and L** is the lag term number. Several lags are projected to make the disturbance terms unconditionally white noise.

Bivariate Cointegration Test

For checking the long-run relationship, the study employs the Co-integration and Vector Error Correction models in the capital markets of Germany, Europe, Switzerland, London, Spain and the Netherlands. If the price series are non-stationary at the level but after differencing, they become stationary, then we could expect a long-run relationship between these series. For studying the long-run relationship in the capital markets of Europe, following VECM model is used.

$$\Delta X_t = \sum_{i=1}^{p-1} |_i + \prod X_{t-1} + \epsilon_t \ ; \ \epsilon_t = \frac{\epsilon_{S,t}}{\epsilon_{F,t}} \approx N \lfloor 0, \Sigma \rfloor \quad (4)$$

In this equation, X_t is the vector of the European stock market prices, Δ characterizes the first difference operator, all the series become stationary at the first or subsequent difference i.e. I (1, 2) and $|_i$ and ∏ are the 2 × 2 matrix coefficients, that measures the long-run and short-run amendments of the stock prices to the variations and disequilibrium in the $X\tau$ and ϵ_t is the 2 × 1 vectors of the white noise error terms.

If any single or multiple co-integrating equations are found, then we can say that European stock markets are co-integrated. The first ratio is λ_{trace}, which observes the number of co-integrating equations, zero or one, and λ_{max} observes the same equations, one or more. The study uses the following equations.

$$\lambda_{trace} (r) = - T \sum_{i=r+1}^{n} ln (1 - \lambda_i) \quad (5)$$

$$\lambda_{max} (r, r+1) = - T \ ln(1 - \lambda_{r+1}) \quad (6)$$

Where n is the number of stock price series, and these are the estimated Eigen values which are measured from the co-integrating matrix of (I +1) × (I +1), and T is the number of observations.

Granger Causality Test

This test is applied to the returns instead of the price series. The further estimation follows the subsequent VAR model:

$$Y_t = \alpha_1 + \sum_{i=1}^{n} \beta_i x_{t-i} + \sum_{j=1}^{m} \gamma_j y_{t-j} + e_{1t} \quad (7)$$

$$x_t = \alpha_2 + \sum_{i=1}^{n} \emptyset_i x_{t-i} + \sum_{j=1}^{m} \delta_j y_{t-j} + e_{2t} \quad (8)$$

The VECM model has expanded in the following equations:

$$\Delta X_t = \alpha_{x,o} + \sum_{i=1}^{p-1} \beta_{X,i} \Delta X_{t-1} + \sum_{j=1}^{p-1} b_{X,i} \Delta Y_{t-1} + \alpha_X Z_{t-1} + e_{X,t} \quad (9)$$

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$$\Delta Y_t = \alpha_{y,o} + \sum_{i=1}^{p-1} \beta_{Y,i}\, \Delta Y_{t-1} + \sum_{j=1}^{p-1} b_{Y,i}\, \Delta X_{t-1} + \alpha_Y Z_{t-1} + e_{Y,t} \qquad (10)$$

As per the above equations, X_t Granger causes the Y_t, if $\beta_{Y,i}$ Coefficients are not equal to zero, and its error correction Coefficient α_Y for Y prices are significant. Similarly, Y_t Granger causes the X_t if, $\beta_{X,i}$ coefficients are not zero and the error correction coefficients α_X are significant. There could be unidirectional causality and bidirectional causality as well if different markets cause each other, which is also called a feedback relationship.

Empirical Results and Discussion

For checking the order of integration of the price series, the ADF test is used, which necessitates that the data must be statistically independent and homoscedastic in nature. Two distinct tests are run, one with constant and no trend, while the second is run with constant and time trend. Results are reported in the table, and it shows that all the price series are non-stationary at the level, but the same series becomes stationary after its first time differencing. So, series are integrated of the same first order, i.e. I (1). From this, we can reject the null hypothesis of a unit root and accept the alternative one.

Table 1 ADF test at Level and First Difference

	At level		At first Difference	
Companies	**T-Statistics**	**Probability**	**T-Statistics**	**Probability**
DAX	-1.954990	0.3072	-61.22273	0.0001*
EURONEXT	-1.882760	0.3408	-61.96079	0.0001*
LSE	-1.405795	0.5810	-58.94063	0.0000*
SWISS	-1.863474	0.3500	-45.16629	0.0001*
IBEX	-1.697617	0.4324	-62.22825	0.0001*
FTSE	-1.260408	0.6500	-46.01434	0.0001*

VAR Lag Order Selection Criteria

The lag values are selected on the basis of Schwartz-based criteria, and after checking the equation, the study finds that the appropriate lag length is 2 and model 2nd is being selected with trend assumption i.e. with no deterministic trend (restricted constant) is appropriate because at this level the value of is λ_{trace} greater than λ_{max}. Now, while conducting the co-integration test, these lags and models are required for finding the suitable results of long-term relationships in the European stock markets.

Table 2. VAR Lag Order Selection Criteria

Indigenous Variables	Lag	Log L	SC
DAX, EURONEXT, SWISS, LSE, IBEX, FTSE	2	-127265.8	67.95567*

Bivariate Cointegration Analysis

After the selection of a suitable lag and model, the Johansen and Juselius approach is used. Trace and Maximum Statistics have been used to test the null hypothesis against

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the alternative one. The test is run on the price series directly instead of their returns, and the results show that one co-integrating equation at 1% level exists between all the stock markets of Germany, Europe, Switzerland, London, Spain and the Netherlands. The results show that there is a strong relationship between all the stock markets for the period under study, i.e. from 2001 to 2025. So, European stock markets are integrated in the long run, which supports the use of the Vector Error Correction Model (VECM) for studying the short-run relationships among these stock markets.

Table 3. Bivariate Cointegration Analysis

Null Hypothesis	Alternative Hypothesis	Eigen Value	Trace Statistics	5% Critical Value	Probability
DAX EURONEXT SWISS LSE IBEXFTSE					
λ_{trace} **Test**					
r = 0	**r > 0**	0.015577	119.8992	103.8473	0.0029*
r ≤ 0	**r > 1**	0.006551	60.78879	76.97277	0.4433
λ_{max} **Test**					
r = 0	**r > 1**	0.015577	59.11045	40.95680	0.0002*
r ≤ 0	**r > 2**	0.006551	24.74596	34.80587	0.4661

Empirical Results of VECM

The study extends the co-integration and uses the VECM to check the short-run relationship in the stock markets of Europe. Short-run tests say about the direction of causality amongst the different markets, whereas ECTs (Error correction terms) say about the slice of long-run disequilibrium in one variable being adjusted by the short-run variations in other variables. Significant results of both tests can affirm the market as endogenous to the system.

Results show that substantial disequilibrium has taken place in all the stock markets of Germany, Europe, Switzerland, London and Spain, except the stock market of the Netherlands, while only IBEX, i.e. the stock market of Spain, moves in the reverse course for adjusting this disequilibrium. ECTs illustrate the significant and negative values 8 times in the lagged values of its prices whereas it displays the significant and positive sign 6 times in the lagged values of price series of the DAX, EURONEXT, LSE, SWISS, IBEX and FTSE that means noteworthy imbalance has been take place in the capital market of Europe from 2001 to 2025 but only few stock markets reverse its situation to nullify this imbalance. So, from this it is clear that the process of adjustment is significantly prominent in the stock markets of Germany, Switzerland, London and Spain as compared to the stock markets of Europe and the Netherlands.

Table 4. Empirical Results of VECM

EC	D(DAX)	D(EURONEXT)	D(SWISS)	D(LSE)	D(IBEX)	D(FTSE)
CointEq1	0.003181	0.000454	0.005355	0.004892	-0.080042	0.000702

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	[2.32023]*	[3.20558] *	[4.61837] *	[4.25030] *	[-4.22731] *	[0.70587]
D(DAX(-1))	-0.111042	-0.003159	-0.073175	-0.035512	0.157342	-0.050239
	[-3.09455] *	[-0.85155]	[-2.41076] *	[-1.17881]	[0.31746]	[-1.92858]
D(DAX(-2))	0.006018	0.006906	0.006439	-0.004149	0.460598	-0.025098
	[0.16756]	[1.85968]	[0.21194]	[-0.13758]	[0.92843]	[-0.96254]
D(EURONEXT(-1))	-0.093387	-0.125958	-0.511461	-0.748651	-1.827322	4.321763
	[-0.22911]	[-2.98902] *	[-1.48337]	[-2.18772] *	[-0.32457]	[14.6051] *
D(EURONEXT(-2))	-0.333440	-0.105564	-0.146521	-0.249972	-0.768782	1.153500
	[-0.75503]	[-2.31212] *	[-0.39222]	[-0.67421]	[-0.12603]	[3.59792] *
D(SWISS(-1))	0.157769	0.015943	0.110067	0.128254	0.426586	0.191110
	[4.19151] *	[4.09694]	[3.45690]	[4.05859]	[0.82053]	[6.99389]
D(SWISS(-2))	0.005669	0.000678	-0.062663	0.014860	0.386971	0.032515
	[0.14800]	[0.17116]	[-1.93392]	[0.46207]	[0.73142]	[1.16930]
D(LSE(-1))	0.044050	0.005085	0.039700	0.014573	-0.076351	0.051996
	[1.80838]	[2.01920] *	[1.92669]	[0.71258]	[-0.22693]	[2.94032] *
D(LSE(-2))	-0.017544	-0.001442	-0.000710	-0.037690	-0.103098	0.012853
	[-0.71996]	[-0.57234]	[-0.03445]	[-1.84226]	[-0.30631]	[0.72657]
D(IBEX(-1))	0.000525	0.000132	0.000293	-7.79E-05	-0.013232	0.002368
	[0.43314]	[1.05218]	[0.28530]	[-0.07657]	[-0.79011]	[2.69005] *
D(IBEX(-2))	0.000995	0.000114	0.000645	-0.000521	0.014672	0.000445
	[0.81771]	[0.90848]	[0.62608]	[-0.51023]	[0.87261]	[0.50374]
D(FTSE(-1))	0.002278	0.001334	0.028878	0.036074	-1.345994	-0.183860
	[0.05211]	[0.29503]	[0.78082]	[0.98276]	[-2.22883] *	[-5.79256] *
D(FTSE(-2))	-0.031905	-0.004926	-0.019943	0.006140	0.067807	-0.018966
	[-1.32501]	[-1.97872] *	[-0.97913]	[0.30372]	[0.20388]	[-1.08500]

Empirical Analysis of the Granger Causality Test

If co-integration is there between the series, then there exists causality between these series too. Results display the rejection of the null hypothesis while the rejection of the alternative one, and additionally, it shows that there is unidirectional causality from LSE to DAX, LSE to EURONEXT, IBEX to EURONEXT, LSE to SWISS and from LSE to FTSE. A feedback relationship has been observed between the stock markets of DAX and EURONEXT, SWISS and DAX, IBEX and DAX, FTSE and DAX, SWISS and EURONEXT, FTSE and EURONEXT, FTSE and SWISS and FTSE and IBEX while no relationship is observed in the stock markets of LSE and DAX, LSE and EURONEXT, IBEX and EURONEXT, LSE and SWISS and LSE and FTSE.

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Table 5. Granger Causality Test

Countries	F-Statistics	Probability
EURONEXT does not Granger Cause DAX	32.6633	9.E-15*
DAX does not Granger Cause EURONEXT	4.31992	0.0134*
SWISS does not Granger Cause DAX	37.1742	1.E-16*
DAX does not Granger Cause SWISS	14.0320	8.E-07*
LSE does not Granger-cause DAX	17.3900	3.E-08*
DAX does not Granger Cause LSE	0.17169	0.8422
IBEX does not Granger-cause DAX	5.25706	0.0052*
DAX does not Granger Cause IBEX	3.40880	0.0332*
FTSE does not Granger-cause DAX	9.89768	5.E-05*
DAX does not Granger Cause FTSE	1392.67	0.0000*
SWISS does not Granger Cause EURONEXT	13.8625	1.E-06*
EURONEXT does not Granger Cause SWISS	6.12689	0.0022*
LSE does not Granger-cause EURONEXT	11.0866	2.E-05*
EURONEXT does not Granger-cause LSE	0.36840	0.6919
IBEX does not Granger Cause EURONEXT	2.95288	0.0523*
EURONEXT does not Granger-cause IBEX	0.48186	0.6177
FTSE does not Granger Cause EURONEXT	5.06210	0.0064*
EURONEXT does not Granger Cause FTSE	2113.68	0.0000*
LSE does not Granger-cause SWISS	3.41602	0.0329*
SWISS does not Granger-cause LSE	1.84697	0.1579
IBEX does not Granger-cause SWISS	1.11623	0.3276
SWISS does not Granger-cause IBEX	1.96530	0.1403
FTSE does not Granger Cause SWISS	4.35694	0.0129*
SWISS does not Granger Cause FTSE	1626.37	0.0000*
IBEX does not Granger-cause LSE	0.80472	0.4473
LSE does not Granger-cause IBEX	0.25113	0.7779
FTSE does not Granger-cause LSE	0.43840	0.6451
LSE does not Granger-cause FTSE	388.231	5E-154*
FTSE does not Granger-cause IBEX	4.70559	0.0091*
IBEX does not Granger-cause FTSE	93.2288	3.E-40*

Impulse response test

For analysing the dynamic interaction between all the stock markets in the post-sample period, impulse response functions (IRFs) and variance decompositions (VDCs) are used. Impulse response test shows the individual responses of the stock markets of

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Germany, Europe, Switzerland, London, Spain and the Netherlands concerning all the other stock markets. It shows that the stock markets of Germany, London, Netherlands and Spain respond significantly to their own stock markets and the stock market of Europe doesn't respond significantly to the stock market of any country while the Stock market of Switzerland respond significantly to the stock market of Germany instead of its own market and it is also evident from bidirectional causality between these two markets.

Table 6. Impulse response test

			Response of DAX:			
Period	**DAX**	**EURONEXT**	**SWISS**	**LSE**	**IBEX**	**FTSE**
1	94.23738	0.000000	0.000000	0.000000	0.000000	0.000000
2	94.41537	5.278277	8.371853	2.888943	1.013222	-0.893763
3	91.85287	3.806444	8.042802	2.072400	2.620523	-3.832610
4	90.30911	2.774107	6.425178	1.806438	2.766213	-4.551567
5	90.54740	2.778389	5.717971	1.735832	3.050684	-5.421389
			Response of EURONEXT:			
Period	**DAX**	**EURONEXT**	**SWISS**	**LSE**	**IBEX**	**FTSE**
1	8.660582	4.464760	0.000000	0.000000	0.000000	0.000000
2	8.499472	4.511044	0.862594	0.335568	0.215256	-0.054120
3	8.302984	4.123747	0.819907	0.269267	0.392240	-0.519288
4	8.086371	4.034022	0.621470	0.229112	0.398236	-0.572792
5	8.120867	4.046670	0.534227	0.217869	0.435007	-0.680880
			Response of SWISS:			
Period	**DAX**	**EURONEXT**	**SWISS**	**LSE**	**IBEX**	**FTSE**
1	59.04040	27.73411	45.83309	0.000000	0.000000	0.000000
2	56.78011	29.80916	51.56965	2.511240	0.942483	0.247022
3	53.76758	28.22679	48.24629	2.639984	2.299274	-2.789599
4	53.09317	27.58572	46.60976	2.356604	2.626125	-3.995538
5	53.54887	27.56343	45.93534	2.232925	3.063464	-5.341378
			Response of LSE:			
Period	**DAX**	**EURONEXT**	**SWISS**	**LSE**	**IBEX**	**FTSE**
1	28.82980	18.50259	32.11415	63.68635	0.000000	0.000000
2	28.25750	19.37315	37.86640	64.52548	0.417533	0.908884
3	27.03578	18.83265	36.89425	62.17817	0.271765	-0.311674
4	27.33396	19.03007	35.63958	62.17712	0.732785	-1.658005
5	27.60202	18.99366	34.91214	62.22762	1.225168	-3.032730
			Response of IBEX:			
Period	**DAX**	**EURONEXT**	**SWISS**	**LSE**	**IBEX**	**FTSE**
1	190.8340	187.3697	140.1983	89.47785	1263.073	0.000000
2	188.1400	183.6670	166.9430	87.36028	1237.955	-65.95130
3	183.0610	157.1503	180.1643	77.13275	1244.994	-21.69280
4	181.4835	162.0284	189.9740	78.22278	1236.649	-3.642081
5	180.0201	165.7132	201.2993	79.71570	1229.553	19.07225

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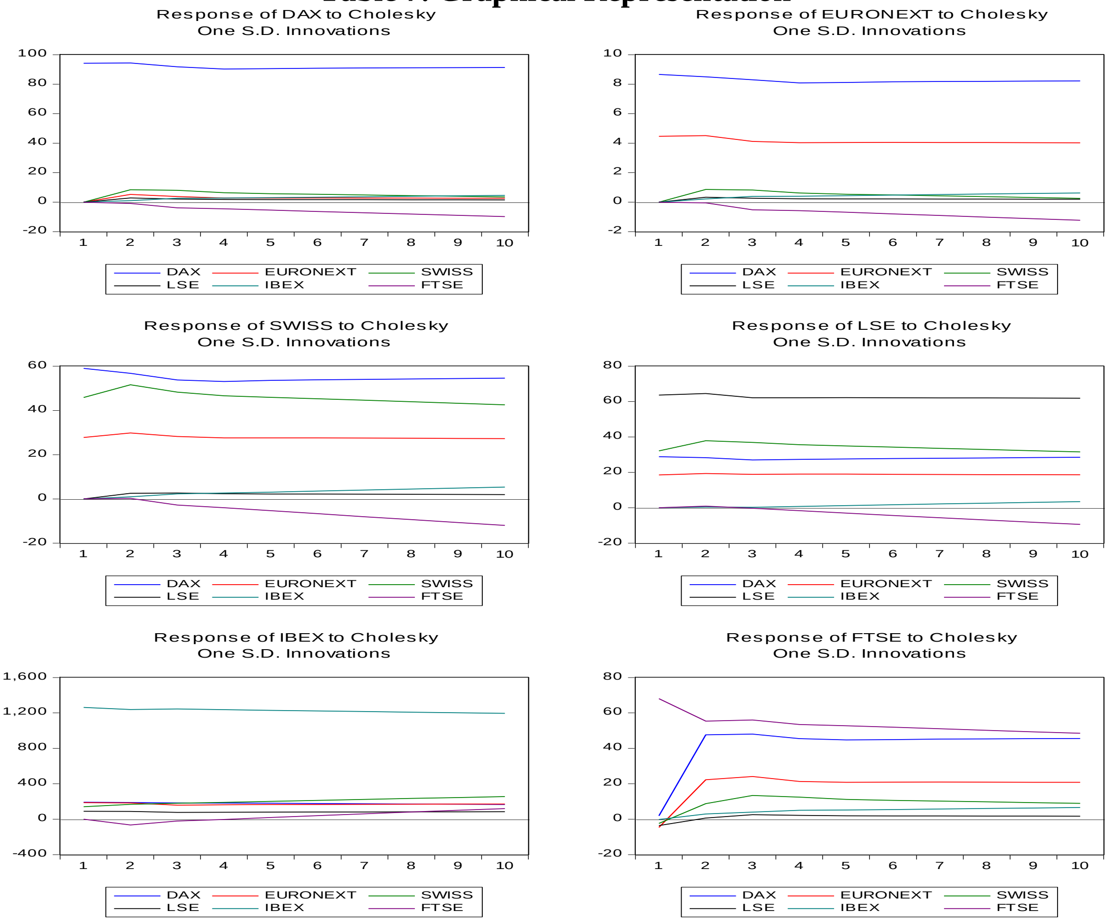
Response of FTSE:

Period	DAX	EURONEXT	SWISS	LSE	IBEX	FTSE
1	1.905048	-4.656515	-2.373067	-3.596946	-0.169393	68.09734
2	47.66383	22.27129	8.757052	0.591046	2.925256	55.36474
3	48.07036	24.13348	13.40076	2.566346	4.008904	55.98520
4	45.50277	21.26842	12.47541	2.152967	5.015216	53.47560
5	44.73464	20.83235	11.17585	1.884257	5.164275	52.73929

Combined graph

Table 7. Graphical Representation



Variance decomposition

Variance Decomposition test checks the overall variation in the market, i.e. how much correction is being done in each stock market in one day to balance out the disequilibrium. Results show that the majority of the corrections in the stock markets of Germany, London, Spain and the Netherlands are done by their own stock markets, while the corrections in the stock markets of Europe and Switzerland are done by the London stock market instead of their own.

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Table 8. Variance decomposition

Period	S.E.	DAX	EURONEXT	SWISS	LSE	IBEX	FTSE
Variance Decomposition of DAX:							
1	94.23738	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	133.8023	99.39608	0.155617	0.391486	0.046618	0.005734	0.004462
3	162.6193	99.19400	0.160141	0.509640	0.047800	0.029850	0.058566
4	186.2294	99.15298	0.144299	0.507643	0.045858	0.044824	0.104392
5	207.2736	99.12509	0.134453	0.485897	0.044032	0.057847	0.152682
Variance Decomposition of EURONEXT:							
Period	**S.E.**	**DAX**	**EURONEXT**	**SWISS**	**LSE**	**IBEX**	**FTSE**
1	9.743704	79.00344	20.99656	0.000000	0.000000	0.000000	0.000000
2	13.72721	78.14139	21.37784	0.394865	0.059758	0.024589	0.001554
3	16.59968	78.45646	20.79079	0.513997	0.067179	0.072650	0.098926
4	18.92452	78.62222	20.54022	0.503309	0.066344	0.100179	0.167723
5	21.01064	78.72383	20.37339	0.472976	0.064576	0.124139	0.241088
Variance Decomposition of SWISS:							
Period	**S.E.**	**DAX**	**EURONEXT**	**SWISS**	**LSE**	**IBEX**	**FTSE**
1	79.72215	54.84544	12.10237	33.05219	0.000000	0.000000	0.000000
2	114.6075	51.08347	12.62111	36.24017	0.048012	0.006763	0.000465
3	138.4569	50.08107	12.80375	36.97281	0.069252	0.032211	0.040912
4	157.9590	49.77579	12.88719	37.11375	0.075465	0.052388	0.095416
5	175.3033	49.74439	12.93548	36.99926	0.077496	0.073073	0.170307
Variance Decomposition of LSE:							
Period	**S.E.**	**DAX**	**EURONEXT**	**SWISS**	**LSE**	**IBEX**	**FTSE**
1	79.12505	13.27564	5.468111	16.47271	64.78355	0.000000	0.000000
2	114.1621	12.50400	5.506529	18.91496	63.06683	0.001338	0.006338
3	139.0901	12.20185	5.542902	19.77854	62.47066	0.001283	0.004772
4	159.9838	12.14200	5.604561	19.91243	62.32360	0.003068	0.014347
5	178.3796	12.16116	5.641977	19.84774	62.30149	0.007185	0.040446
Variance Decomposition of IBEX:							
Period	**S.E.**	**DAX**	**EURONEXT**	**SWISS**	**LSE**	**IBEX**	**FTSE**
1	1301.745	2.149114	2.071794	1.159935	0.472475	94.14668	0.000000
2	1826.487	2.152671	2.063545	1.424604	0.468761	93.76004	0.130381
3	2232.297	2.113635	1.877070	1.605104	0.433211	93.87425	0.096729
4	2571.743	2.090486	1.811202	1.755024	0.418914	93.85129	0.073080
5	2869.280	2.073046	1.788599	1.902109	0.413724	93.75939	0.063128
Variance Decomposition of FTSE:							
Period	**S.E.**	**DAX**	**EURONEXT**	**SWISS**	**LSE**	**IBEX**	**FTSE**
1	68.41899	0.077528	0.463200	0.120300	0.276385	0.000613	99.06197
2	102.9556	21.46699	4.883966	0.776590	0.125354	0.080999	72.66610
3	129.7290	27.25094	6.536797	1.556171	0.118086	0.146510	64.39150
4	149.6580	29.72083	6.931406	1.864194	0.109426	0.222388	61.15176
5	166.6411	31.17807	7.153417	1.953359	0.101044	0.275410	59.33870

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Results Discussion

Results shows that in long run, all the stock markets of Germany, Europe, Switzerland, London, Spain and Netherlands are cointegrated because the capital markets of Europe are well developed and there is a free flow of the capital and theory suggest that free flow of the capital should results in the strong integration of the markets. So the results are consistent with the theory. The implication for the international and institutional investors is that in the long run, the potential gain from the international portfolio diversification in the stock markets of Germany, Europe, Switzerland, London, Spain and the Netherlands won't work at all on account of the strong integration of these capital markets.

In the short run, results show that significant imbalances has been taken place in all the stock markets of Europe as vibrant changes have taken place in the last two decades on account of several local and international factors. Due to this huge change all the markets should respond to it but surprisingly as per results it's the stock market of Spain only which moves in the opposite direction to nullify it and move back to its original state of equilibrium while the results of the Short run error correction shows that adjustment process is more prominent in the stock markets of Germany, Switzerland, London and Spain as compared to the stock markets of Europe and Netherlands.

Lead lag relationship between these markets are checked by Granger Causality and results shows the unidirectional causality from LSE to DAX, LSE to EURONEXT, IBEX to EURONEXT, LSE to SWISS and from LSE to FTSE which means London stock market is leading the majority of the European Capital market because of its sound financial and governance system. Further, it also allows the local investors to invest in the stock market along with the institutional investors. A feedback relationship has been observed between the stock markets of DAX and EURONEXT, SWISS and DAX, IBEX and DAX, FTSE and DAX, SWISS and EURONEXT, FTSE and EURONEXT, FTSE and SWISS and in FTSE and RIBEX, which implies the stronger integration of their capital markets which allows their investors to invest freely in their capital markets. At the end, no relationship is observed in the stock markets of LSE and DAX, LSE and EURONEXT, IBEX, and EURONEXT, LSE and SWISS and LSE and FTSE, which means prices cannot be discovered in these stock markets despite having strong integration between these markets.

Furthermore, the results shows that the stock markets of Germany, London, Netherlands and Spain respond significantly to their own stock markets and the stock market of Europe doesn't respond significantly to any of the stock market while the Stock market of Switzerland respond significantly to the stock market of Germany instead of its own market which is also evident from bidirectional causality, on account of the strong bilateral and political relationship between these two countries which are based on a set of over 200 agreements between both of them.

As per results of Variance Decomposition, majority of the correction in the stock markets of Germany, London, Spain and Netherlands is done by their stock markets to balance out the disequilibrium of these markets while the correction in the stock markets of Europe and Switzerland are done by the London stock market instead

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of their own because London stock market is the one of leading market in the Europe which has a strong influence on the rest of the European Capital markets.

Conclusion

The study explores the long-run co-integration among the stock markets of Germany, Switzerland, Europe Netherlands, Spain, and London. This shows that all of these capital markets are integrated the free capital flow shows the consistency with the Financial integration theory. This implies that the investors 'benefits of diversification are limited in the European markets due to their strong integration. Moreover, in the short run, imbalances occur in these markets, and the stock market of Spain moves opposite direction to restore its mean position. On the other hand, the stock markets of Germany, London, Switzerland, and Spain show significant adjustment towards their equilibrium positions as compared to other markets.

The findings of Granger Causality have shown that the stock market of London is leading the majority of the European equity markets, and this is confirmed by the presence of a feedback relationship among them. Then, Impulse response and variance decompositions test shows that all of these markets adjust to their equilibrium positions except the stock markets of Euronext and Switzerland, as these are affected by the stock market of London. Overall, it shows that the stock market of London is playing a central and significant role in the European stock markets and their dynamics.

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